

**PATENT COOPERATION TREATY**

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:  
**HILL & SCHUMACHER**  
87 Falcon Street  
TORONTO, Ontario  
Canada, M4S 2P4

**PCT**

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

(PCT Rule 43bis.1)

|  |   |   |   |                      |                                     |          |                                      |  |  |                            |   |   |                                     |                         |   |  |  |   |
|--|---|---|---|----------------------|-------------------------------------|----------|--------------------------------------|--|--|----------------------------|---|---|-------------------------------------|-------------------------|---|--|--|---|
|  |   | Date of mailing<br>(day/month/year)      22 April 2005 (22-04-2005) |   |                      |                                     |          |                                      |  |  |                            |   |   |                                     |                         |   |  |  |   |
| Applicant's or agent's file reference<br>349041P   |   | <b>FOR FURTHER ACTION</b><br>See paragraph 2 below                  |   |                      |                                     |          |                                      |  |  |                            |   |   |                                     |                         |   |  |  |   |
| International application No.<br><b>PCT/CA2004/001773</b>  | International filing date (day/month/year)<br>04 October 2004 (04-10-2004)  | Priority date (day/month/year)<br>02 October 2003 (02-10-2003)      |   |                      |                                     |          |                                      |  |  |                            |   |   |                                     |                         |   |  |  |   |
| International Patent Classification (IPC) or both national classification and IPC<br>IPC <sup>7</sup> C08L 53/02, C08L 23/16, C08L 23/22, F42B 12/72, B29C 43/00, B29C 45/00   |   |   |   |                      |                                     |          |                                      |  |  |                            |   |   |                                     |                         |   |  |  |   |
| Applicant<br><b>THE UNIVERSITY OF WESTERN ONTARIO ET AL</b>  |   |   |   |                      |                                     |          |                                      |  |  |                            |   |   |                                     |                         |   |  |  |   |
| <p>1. This opinion contains indications relating to the following items :</p> <table> <tbody> <tr> <td><input checked="" type="checkbox"/> Box No. I</td> <td>Basis of the opinion</td> </tr> <tr> <td><input type="checkbox"/> Box No. II</td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/> Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input checked="" type="checkbox"/> Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/> Box No. V</td> <td>Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement.</td> </tr> <tr> <td><input type="checkbox"/> Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input checked="" type="checkbox"/> Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input checked="" type="checkbox"/> Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </tbody> </table> <p>2. <b>FURTHER ACTION</b><br/>If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.<br/>If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.<br/>For further options, see Form PCT/ISA/220.</p> <p>3. For further details, see notes to Form PCT/ISA/220.</p> |   |   | <input checked="" type="checkbox"/> Box No. I | Basis of the opinion | <input type="checkbox"/> Box No. II | Priority | <input type="checkbox"/> Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability | <input checked="" type="checkbox"/> Box No. IV | Lack of unity of invention | <input checked="" type="checkbox"/> Box No. V | Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement. | <input type="checkbox"/> Box No. VI | Certain documents cited | <input checked="" type="checkbox"/> Box No. VII | Certain defects in the international application | <input checked="" type="checkbox"/> Box No. VIII | Certain observations on the international application |
| <input checked="" type="checkbox"/> Box No. I  | Basis of the opinion  |   |   |                      |                                     |          |                                      |  |  |                            |   |   |                                     |                         |   |  |  |   |
| <input type="checkbox"/> Box No. II  | Priority  |   |   |                      |                                     |          |                                      |  |  |                            |   |   |                                     |                         |   |  |  |   |
| <input type="checkbox"/> Box No. III   | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |   |   |                      |                                     |          |                                      |  |  |                            |   |   |                                     |                         |   |  |  |   |
| <input checked="" type="checkbox"/> Box No. IV   | Lack of unity of invention  |   |   |                      |                                     |          |                                      |  |  |                            |   |   |                                     |                         |   |  |  |   |
| <input checked="" type="checkbox"/> Box No. V  | Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement. |   |   |                      |                                     |          |                                      |  |  |                            |   |   |                                     |                         |   |  |  |   |
| <input type="checkbox"/> Box No. VI  | Certain documents cited   |   |   |                      |                                     |          |                                      |  |  |                            |   |   |                                     |                         |   |  |  |   |
| <input checked="" type="checkbox"/> Box No. VII  | Certain defects in the international application  |   |   |                      |                                     |          |                                      |  |  |                            |   |   |                                     |                         |   |  |  |   |
| <input checked="" type="checkbox"/> Box No. VIII   | Certain observations on the international application   |   |   |                      |                                     |          |                                      |  |  |                            |   |   |                                     |                         |   |  |  |   |
| Name and mailing address of the ISA/CA<br>Canadian Intellectual Property Office<br>Place du Portage I, C114 - 1st Floor, Box PCT<br>50 Victoria Street<br>Gatineau, Quebec K1A 0C9<br>Facsimile No.: 001(819)953-2476  | Authorized officer<br><br>Tony F. Neppel (819) 997-2890   |   |   |                      |                                     |          |                                      |  |  |                            |   |   |                                     |                         |   |  |  |   |

**Box No. I Basis of this opinion**

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.  
  
[ ] This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of :
  - a. type of material  
[ ] a sequence listing  
[ ] table(s) related to the sequence listing
  - b. format of material  
[ ] in written format  
[ ] in computer readable form
  - c. time of filing/furnishing  
[ ] contained in the international application as filed.  
[ ] filed together with the international application in computer readable form.  
[ ] furnished subsequently to this Authority for the purposes of search.
3. [ ] In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statement that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments :

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/CA2004/001773

Box No. IV      Lack of unity of invention

1.  In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has :  
 paid additional fees  
 paid additional fees under protest  
 not paid additional fees
2.  This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is  
 complied with  
 not complied with for the following reasons :
4. Consequently, this opinion has been established in respect of the following parts of the international application :  
 all parts  
 the parts relating to claim Nos.

**Box No. V**

**Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

|                               |        |        |     |
|-------------------------------|--------|--------|-----|
| Novelty (N)                   | Claims | 1 - 33 | YES |
|                               | Claims | none   | NO  |
| Inventive step (IS)           | Claims | none   | YES |
|                               | Claims | 1 - 33 | NO  |
| Industrial applicability (IA) | Claims | 1 - 33 | YES |
|                               | Claims | none   | NO  |

**2. Citations and explanations :**

D1 KIM, JEONG H. et al, Polymeric Materials Science and Engineering 2001, Vol. 85, pages 346-347

D2 EP 641836 (GARDNER, JOHN C. et al) 8 March 1995

D3 WO 01/42343 (FRAUNHOFER GES.) 14 June 2001

D4 WO 02/085953 (BRIDGESTONE/FIRESTONE NORTH AMERICAN TIRE, LLC) 31 Oct. 2002

D5 EP 1067164 (SAINT-GOBAIN PERFORMANCE PLASTICS CORP.) 10 Jan. 2001

**Novelty and Inventive Step - Articles 33(2) and 33(3) PCT**

D1 outlines composite materials comprising a thermoplastic elastomer (TPE), namely a polystrene-polybutadiene block copolymer (denoted as SBS) or a polystyrene-poly(ethylene-butylene)-polystyrene copolymer (SEBS), and a thermoset (soft) elastomer, namely, an ethylene-propylene rubber (EPR) together with a major amount of some inert polymers (Table 2). In a few examples, the same composite materials additionally contain a high specific gravity filler, namely, iron oxide ( $Fe_2O_3$ ) in a minor amount. While the compositions of these prior-art materials fall within the scope of Applicant's claims 26 to 29 and 31, D1 does not address their creep behaviour. Since the prior-art materials contain a major amount of inert polymers which appear to be rigid under normal conditions, it seems unlikely that they could meet the dynamic mechanical compression creep requirements of claim 26 which also apply to claims 27 to 33. Thus, the claimed composite materials appear to be novel with regard to D1.

D2 teaches composite materials based on a blend of a TPE, particularly, a polystyrene-polybutadiene block copolymer or a polystyrene-polyisoprene block copolymer, with a rigid thermoplastic polymer such as polypropylene (PP). This blend hosts a major amount (up to 70 weight %) of a high specific gravity filler, for instance, iron, bismuth or, preferably, tungsten. The same document also discloses how a polymer-based ammunition is manufactured from these prior-art composite materials. It is appreciated that they differ from Applicant's composite materials and ammunitions insofar as they contain a thermoplastic polymer instead of a soft elastomer. However, this difference does not seem to amount to an inventive step. At the relevant date, if a skilled person had sought a TPE-based composite material suitable for ammunition and having a pre-selected dynamic mechanical creep below a threshold creep, he or she would have been inclined to replace the rigid thermoplastic polymer component in the composite materials of D2 with a substantially less rigid, soft elastomer, and would have arrived at composite materials within the scope of claims 26 to 33. Furthermore, since D1 shows that a TPE is simultaneously miscible with a soft elastomer and a high specific gravity filler in the presence of some inert polymers, a skilled person would have predicted that the same three components (TPE, soft elastomer and high specific gravity filler) retain their miscibility in the absence of the inert polymers, and form a stable composite material in line with claims 26 to 33.

(continued in Supplemental Box)

**Box No. VII      Certain defects in the international application**

The following defects in the form or contents of the international application have been noted :

In the description, the statement "which is incorporated herein by reference" appears to lack clarity (page 1, line 5). Furthermore, the document which reference is made to, is not properly identified. For example, its date of publication is not set forth.

Likewise, at page 12, line 14, Applicant refers to another document which is identified as "Macromolecules , submitted (2004)". This identification appears to be inadequate.

**Box No. VIII      Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claims 1, 3, 12 to 14, 23, 24 and 26 to 30 do not comply with Article 6 PCT for the following reasons:

- A) In claims 1 and 30, the wording "from at least about 2 to 3" lacks clarity. It seems unclear what the lower limit of this range is. The current wording implies but fails to state clearly that the lower limit could be about 2 or could be larger than 2. Instead, the description tends to suggest a wording like "from about 2 to 3".
- B) In claims 1 to 17, 30 and 33, the "sufficiently high specific gravity material" is not defined adequately. Moreover, the claimed ammunition or composite material which contains this high specific gravity material without any further definition, as outlined in these claims, does not have proper support in the description. Instead, the description shows, particularly on pages 6 and 14, that the high specific gravity material corresponds to a fine metal powder.
- C) In claims 3 and 27, the term "hydrogenated versions of these (polystyrene-poly(ethylene-butylene) block copolymers" appears to lack clarity. The word "these" is believed to be redundant.
- D) In claims 12 to 14, the term "high density weight material" seems inconsistent with the respective term employed in claim 1, namely, "high specific gravity material". Since claims 12 to 14 depend on claim 1, Article 6 appears to require that Applicant use the same term to denote the same material in claim 1 as well as in claims 12 to 14.
- E) In claims 23, 24 and 26, the "pre-selected dynamic mechanical compression creep", "suitable threshold creep" and "pre-selected period of time" are not defined adequately.
- F) Claims 26 to 29 lack adequate support in the description. These claims define composite materials which do not generally contain a high specific gravity material. However, the description does not seem to set forth any evidence for the utility of these composite materials. Instead, the description tends to teach that a high specific gravity material (filler) is required for the successful use of the claimed composite materials.

Claim 24 adds the same features to claims 1 to 22 as claim 23 does. Thus, claim 24 appears to be redundant in view of claim 23, and to contravene Rule 6.1(a) PCT.

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V

The above prediction is believed to draw additional support from D3, D4 and D5. In brief, D3 outlines composite materials based on soft elastomers which contain a large load of a high specific gravity filler such as iron or iron oxide. According to this document, for instance, blending a halogenated butyl rubber, nitrile-butadiene rubber (NBR) or styrene-butadiene rubber (SBR) with about 40 to 80 weight % of iron oxide, yields a stable and useful composite material. Likewise, D4 reports composite materials based on a soft elastomer, such as SBR, which hosts a high specific gravity metal oxide, for example, up to 150 phr of iron oxide or bismuth oxide ( $\text{Bi}_2\text{O}_3$ ). On the balance, D3 and D4 show that thermoset (soft) elastomers are miscible with high specific gravity fillers on the scale required by Applicant. In a similar way, D5 discloses stable blends of a high specific gravity filler, for example, copper or nickel, with some TPE's, particularly, polystyrene-polybutadiene block copolymers and polystyrene-polyisoprene block copolymers. In these prior-art blends, both filler and TPE occur on nearly the same scale as in Applicant's composite materials. For instance, D5 teaches a filler content of about 10 to 80 weight % (page 5) while Applicant's claim 14 requires a filler content in the range of about 10 to 90 volume %.

In conclusion, the subject matter of claims 1 to 33 appears to be novel over the cited prior art and to comply with Article 33(2)PCT.

As outlined above, D3 and D4 teach the miscibility of high specific gravity fillers with thermoset (soft) elastomers, and D5 points out the miscibility of the same kind of fillers with TPE's. Furthermore, D1 reports the simultaneous miscibility of these fillers with soft elastomers and TPE's. In view of these documents, it would have been within a skilled person's competence if he or she had sought a composite material suitable for ammunition and displaying a pre-selected dynamic mechanical compression creep below a threshold creep, to substitute a soft elastomer for the thermoplastic polymer in the composite materials and ammunitions of D2. Such a substitution would have yielded composite materials within the scope of claims 26 to 33, and ammunitions in line with claims 1 to 25. Thus, claims 1 to 33 are believed to lack an inventive step and to contravene Article 33(3)PCT.

Industrial Applicability - Article 33(4)PCT

Claims 1 to 33 are considered to define industrially applicable subject matter and to comply with Article 33(